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EPA WASTE MINIMIZATION RESEARCH PROGRAM: AN OVERVIEW

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16. ABSTRACT

The U.S. Environmental Protection Agency (EPA) has established a waste minimization research program within the Office of Research and Development's Risk Reduction Engineering Laboratory which is the primary contact for pollution prevention research efforts concentrating on source reduction and recycling. The purpose of this paper is to provide an overview of the Waste Minimization Branch's research programs and to discuss the progress of specific projects. Through four major program areas, the Branch identifies and evaluates relevant production operations and waste management practices, demonstrates waste reduction techniques and technologies, designs and tests prototypes of waste management systems, performs model waste minimization assessments for public and private pollution prevention operation, and participates in a variety of technology transfer activities.

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INTRODUCTION

The concept of "pollution prevention" provides a practical solution to the complex problem of waste management. Pollution prevention is a term that describes approaches to environmental improvement that involves eliminating or reducing the quantity and or toxicity of pollutants rather than treating pollutants for safer disposal. While the goal of total pollution prevention may be unreasonable to achieve in the near future, significant strides are being made to encourage the identification, development, and demonstration of techniques and technologies that result in less waste being generated. No longer can researchers be satisfied with providing support for regulations on pollution limits and control technologies rather than focusing their efforts to avoid producing a waste. When Congress declared a national policy on waste minimization as part of the 1984 Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act, we all had to realize the importance of pollution prevention to the well-being of our environment. This common sense, somewhat simplistic approach of reducing or eliminating the generation of waste is being embraced by industry, academia, government, and other environmentalists.

A formal response to the EPA Administrator from the Science Advisory Board (SAB) entitled "Future Risk: Research Strategies for the 1990's" recommends that EPA shift the focus of its environmental protection strategy from end-of-pipe control technology to pollution prevention. Support for this new focus with a long-term research program for pollution prevention was also endorsed by the SAB. To date, the Agency administers several federal environmental laws to reduce existing pollution problems after the pollution has been generated. The change in focus attacks the pollution problem at the origin without regulatory inducements and requires increased efforts of pollution prevention research, development, and demonstration. (Figure 1)

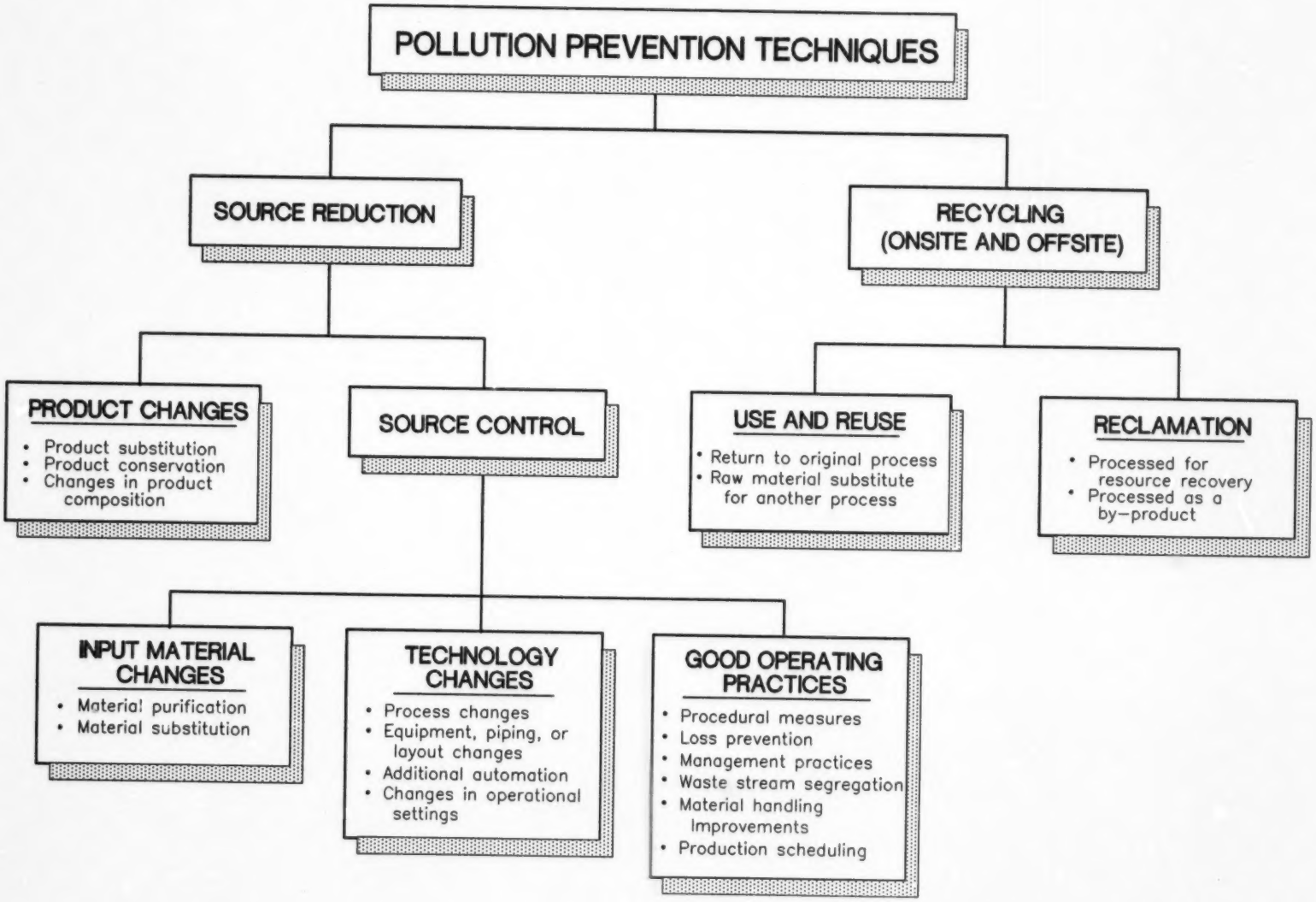

Figure 1. Waste Reduction Techniques

Waste Minimization Branch - Overview

In the summer of 1988, EPA's Office of Research and Development began to emphasize the pollution prevention research needs and considered strategies that defined the most efficient and cost-effective approaches to reducing environmental risk in the future. The Office of Environmental Engineering and Technology Demonstration approved a plan to consolidate the Water Engineering Research Laboratory and the Hazardous Waste Engineering Research Laboratory in Cincinnati, Ohio. The newly formed Risk Reduction Engineering Laboratory (RREL) combined skills and talents to address multimedia research problems. Within RREL, the Waste Minimization Branch (WMB) was established to conduct waste minimization research and is a primary contact within the Agency for pollution prevention research efforts concentrating on source reduction and recycling.

The purpose of this paper is to provide an overview of the Waste Minimization Branch's programs and to discuss the progress of specific projects. The WMB has organized its research activities into four major programs (Figure 2). Through these programs, the Branch identifies and evaluates relevant production operations and waste management practices, demonstrates waste reduction techniques and technologies, designs and tests prototypes of waste management systems, performs model waste minimization assessments for public and private pollution prevention operations, and participates in a variety of technology transfer activities. The WMB also provides technical support to other EPA Offices, industry, State and local governments and other Federal agencies.

FIGURE 2

Waste Minimization Research Programs

* Waste Reduction Innovative Technology Evaluation (WRITE)
* Waste Reduction Evaluations at Federal Sites (WREAFS)
* Waste Reduction Assessments Program (WRAP)
* Waste Minimization Information Clearinghouse (WMIC)

Pollution prevention research conducted within these four programs are concerned with source reduction and recycling (See Figure 1). The waste minimization concept is applied to all media pollution, defined as hazardous and non-hazardous. Each of these programs are discussed as follows:

WRITE Program

The Waste Reduction Innovative Technology Evaluation (WRITE) Program is primarily a research demonstration program designed to evaluate the use of innovative engineering and scientific technologies to reduce the volume of waste produced and the toxicity of wastes generated from the manufacture, processing, and use of materials. The overall goal of the WRITE Program is to promote a national pollution prevention policy by forming research partnerships with EPA, industry, State and local governments and academia in an effort to encourage the development and/or demonstration of effective technologies for waste reduction.

The WRITE Pilot Program, with State and local governments, addresses immediate information transfer needs between government and industry. Through the joint efforts of EPA and various State and local governments, technical and economic evaluations of source reduction and recycling technologies are being conducted of manufacturing and processing operations across approximately twenty industries. States participating in this program include California, Connecticut, Illinois, Minnesota, New Jersey and Washington. The WRITE Program, with industry, focuses on evaluations of waste reduction technologies currently in use or under development by large industries. Under this program, evaluations of waste reduction technologies are performed directly with industrial firms or through industrial trade associations and/or technical societies. The WRITE Research Program focuses on pollution prevention research needs and addresses, various technical obstacles to waste reduction, and to chemical or waste-stream, and industry-specific waste minimization issues and are industrial firms, universities, other government agencies, technical societies, and industrial trade organizations (Figure 3).

The WRITE Program is the cornerstone of the research programs within the WMB with a great potential to transfer pollution prevention information regarding various technologies across diverse industries through the States. Each of the other waste minimization research programs will benefit from the knowledge gathered by the WRITE Program. Early in fiscal year 1989, a guidance document for the WRITE Pilot Program with State and local governments was prepared to describe the WRITE Program and establish an operational approach to conduct pollution prevention research. Cooperative agreements are being negotiated to carry out the objectives of this Program.

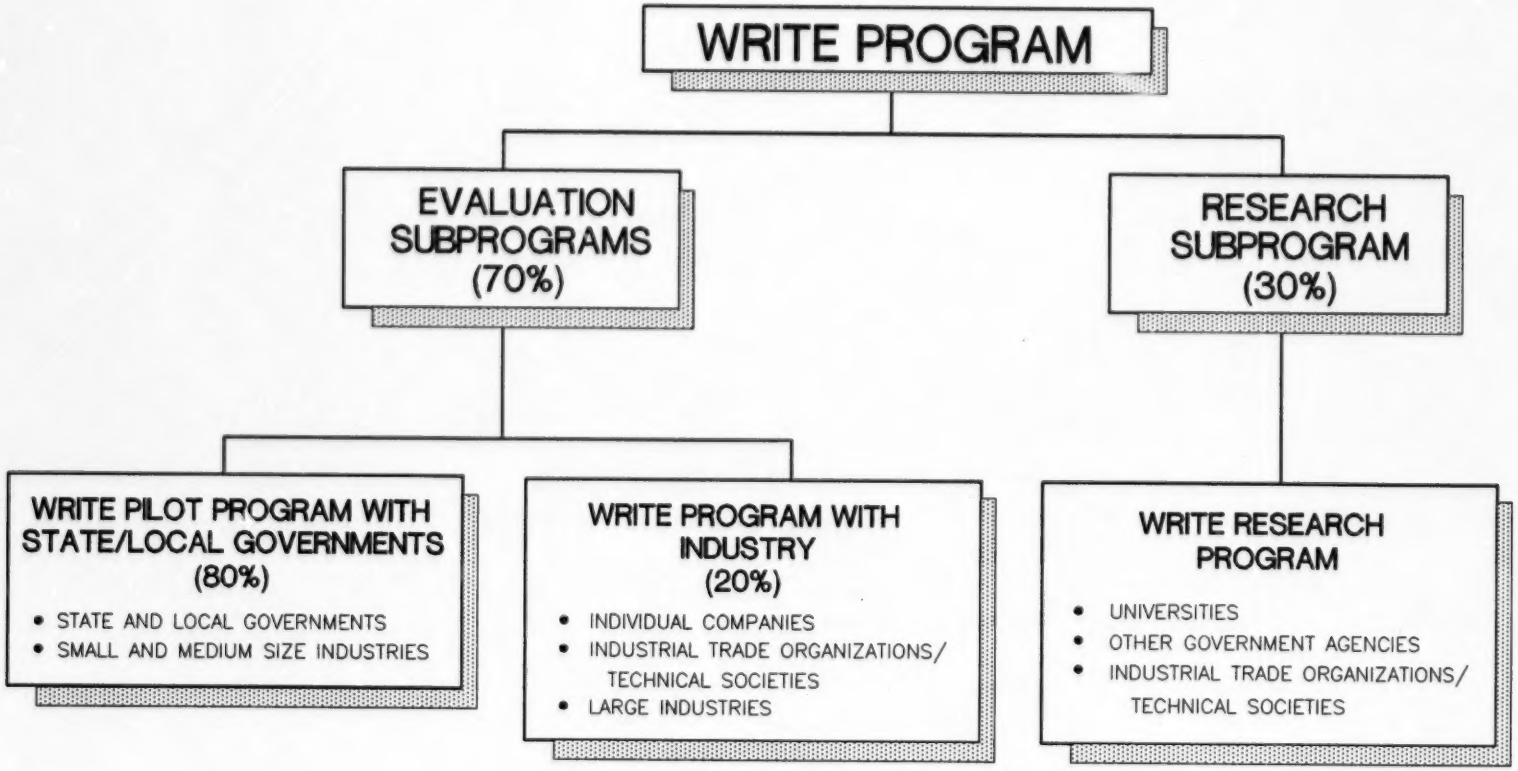
WRITE PROGRAM
EVALUATION SUBPROGRAMS (70%)
RESEARCH SUBPROGRAM (30%)
WRITE PILOT PROGRAM WITH STATE/LOCAL GOVERNMENTS (80%)
• STATE AND LOCAL GOVERNMENTS
• SMALL AND MEDIUM SIZE INDUSTRIES
WRITE PROGRAM WITH INDUSTRY (20%)
• INDIVIDUAL COMPANIES
• INDUSTRIAL TRADE ORGANIZATIONS/ TECHNICAL SOCIETIES
• LARGE INDUSTRIES
WRITE RESEARCH PROGRAM
• UNIVERSITIES
• OTHER GOVERNMENT AGENCIES
• INDUSTRIAL TRADE ORGANIZATIONS/ TECHNICAL SOCIETIES

Figure 3. Subprogram Emphasis in the WRITE Program

The objectives of the WRITE Program are as follows:

* To establish reliable performance and cost information on pollution prevention techniques by conducting evaluations on demonstrations of the more promising innovative technologies.

* To accomplish an early introduction of water-reduction techniques into broad commercial practice.

* To encourage active participation of small and medium-sized companies in evaluating and adopting pollution-prevention concepts by providing support to these companies through State and local government agencies.

* To encourage the transfer of knowledge and technology concerning pollution prevention practices among large, medium-sized and small industries.

* To provide solutions to important chemicals, wastestreams, and industry-specific pollution prevention research needs.

WREAFS Program

The Waste Reduction Evalutions at Federal Sites (WREAFS) Program consists of a series of demonstration and evaluation projects for waste reduction conducted cooperatively by EPA and various parts of the Department of Defense (DOD), Department of Energy (DOE), and other Federal agencies. The WREAFS Program focuses on waste minimization research opportunities and technical information transfer at Federal sites.

Many Federal activities have established waste reduction plans and programs in the past few years. For example, an overall goal within DOD is to reduce hazardous waste generation a total of fifty percent by 1992 compared to 1985. There are several operation and process opportunities for pollution prevention practices at Federal sites which will reduce hazardous and other wastes, and result in providing cost avoidance or cost reduction as well as productivity, environmental, and human health benefits. Waste minimization opportunities can be applied throughout the Federal community in fabrication, production and/or maintenance processes depending on the waste generating function. Industrial activities which support Federal activities through in-house or contract efforts whether on or off-site are generally the same activities within the private sector. The application may vary depending on the final product; however,

waste reduction techniques and technologies should work in both the Federal or private sector. The WREAFS Program encourages the use of any unclassified Federal and industrial pollution prevention information to the maximum extent practicable.

The objectives of the WREAFS Program include the following:

* Conduct waste minimization workshops
* Perform waste minimization opportunity assessments
* Develop technical information transfer opportunities between industry and government
* Provide EPA developed research information to Federal facilities
* Demonstrate waste minimization techniques or technologies at Federal facilities
* Promote and enhance waste minimization benefits within the Federal community

As a result of a November 1988, WREAFS meeting in Washington, D. C. with representatives from the Department of Defense, Veterans Administration and the Environmental Protection Agency, candidate sites were solicited from Federal activities to conduct waste minimization opportunity assessments. Six assessments are planned for in fiscal year 1989 with each branch of the military offering a candidate site along with other agencies. The WREAFS Program anticipates active participation from within the Federal community and will provide the catalyst for technology transfer through EPA's various programs.

WRAP Program

The Waste Reduction Assessments Program (WRAP) is a series of waste minimization assessment projects designed to encourage waste generators to utilize a systematic planned procedure with the objective of identifying options to reduce or eliminate waste. The foundation for the WMB assessment program is the "Waste Minimization Opportunity Assessment Manual" which was produced in July of 1988. This manual has become a model for many industry-specific assessment manuals. Several assessment projects are being conducted through cooperative agreements with the California Department of Health, University City Science Center, and the New Jersey Department of Environmental Protection.

Through the California Department of Health, EPA is developing nine industry-specific waste minimization manuals. These manuals will be available for distribution by late summer of 1989. The industries included are:

* Paint Manufacturing
* Pesticide Formulators
* Commercial Printers
* Metal Fabricators
* Printed Circuit Board Manufacturers
* Hospitals
* Research Laboratories
* Photographic Processing Laboratories
* Fiberglass Manufacturing

Secondly, the California Department of Health is conducting a project to determine the potential for reducing halogenated organic wastes. This study will be completed in late 1989 and will provide results and recommendations regarding halogenated organic waste streams in Los Angeles.

The University City Science Center is utilizing the expertise of engineering schools to conduct waste minimization assessments for small waste generators. Currently, programs exist at Colorado State University and the University of Tennessee. A third engineering school is anticipated within the next few months with each school funded for a three-year period.

Other waste minimization assessments include an ongoing cooperative agreement with the New Jersey Department of Environmental Protection to support thirty demonstration assessments in nine different industries. The EPA research program also is conducting two special studies targeted at conducting demonstration assessments in the Cincinnati area for hospitals and research laboratories.

WMIC Program

EPA's Office of Pollution Prevention and Office of Research and Development are jointly developing the Waste Minimization Information Clearinghouse (WMIC). EPA's October, 1986 Report to Congress on Minimization of Hazardous Wastes expresses the need for EPA to provide assistance to generators through the States, to provide technical support of research and development, and to develop a computerized information system on waste minimization, accessible by the States. There is no doubt that the lack of readily-available information regarding the application of technologies and techniques along with the demonstration of economic benefits of waste minimization is holding back the progress. There appears to be universal support to the establishment of the WMIC by EPA.

In December 1988, a WMIC Workshop was conducted in Cincinnati, Ohio, to develop one or more options for a maximally useful and cost-effective information clearinghouse on waste minimization. The workshop participants endorsed five mechanisms for use by the Clearinghouse. These mechanisms are: 1) establishment of a commonly-accepted accession/indexing technique for clearinghouse holdings; 2) incorporation of a Hotline; 3) publication of a Users' Bulletin; 4) assurance of a hard copy report available to users and;
5) incorporation of an Electronic Information Exchange capability.

The workshop recommended ten products or services for provision by the Clearinghouse. While the amount of funding will dictate what can actually be accomplished in 1989, it was determined that these ten items would be highly desirable. A steering committee from the workshop attendees are continuing to work together during the formulation of final plans for EPA's WMIC. The ten products or services are:

* indexed bibliographies of reports, etc.
* indexed abstracts of reports, publications, etc.
* indexed case studies of demonstrations/evaluations
* lists of contacts (States, EPA, trade associations, etc.)
* calendar of conferences, seminars, events
* information on Federal activities/legislation
* information on State activities/legislation
* electronic bulletin board
* lists of on-going projects (demos, evaluations, R&D, etc.)
* user statistics/profile

The first year of the Clearinghouse will be devoted to assuring mechanisms will work, defining the products and services, and building a technical information data base.

Conclusion

EPA's Waste Minimization Research Program is in its infancy, yet a well-organized structured approach has already paid dividends with the publishing of the "Waste Minimization Opportunity Assessment Manual" and other industry-specific assessment reports. Other projects and programs are being implemented and developed such as the Waste Reduction Institute for Scientists and Engineers (WRISE) which is a joint EPA/University sponsored Institue comprised of thirty-five nationally recognized individuals who have made significant contributions in the field of waste minimization. Each of the

programs described in this paper will provide technical data for information transfer and help to promote the national waste minimization policy. There are a myriad of pollution prevention research opportunities for academia, industry and government. It is the hope of the Agency that progress will continue with the non-regulatory research partnership that has been established and contributions to pollution prevention from EPA will enhance the mission as we end the 1980's and begin the 1990's.

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